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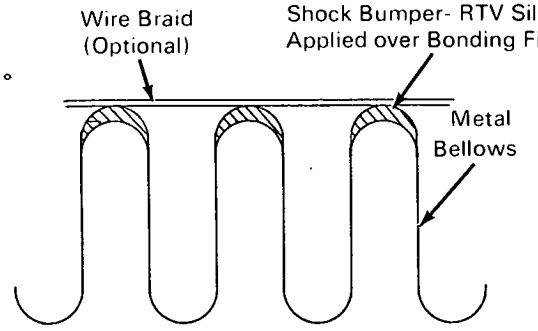
NASA TECH BRIEF

Flexible Protection for Metal Bellows

Metal bellows have long been used in fluid transfer systems to absorb and dissipate vibration that would be damaging to more rigid equipment. To provide flexibility without high bending loads, the bellows wall thickness is often as little as 0.010 inch. This makes the bellows vulnerable to any external physical force (a tool striking it or the bellows striking the sharp corner of a rigid structure). Protection, in the past, has been afforded by surrounding the bellows with a continuous, braided wire sheath. The wire sheath, unfortunately, has two disadvantages in that it contributes appreciable stiffness to the assembly and also provides an excellent transmission path for any sharp force or blow to its surface, resulting in creases and dents in the bellows convolutions.



An in-depth investigation has recently been conducted in an effort to find solutions to the problems of the braid's stiffness and impact transmission. Energy-absorbing materials applied to the bellows' outermost convolutions in five different configurations were subjected to shock, high temperature, low temperature, and salt spray. Of the commercially available plastics employed in the tests, an RTV silicone, applied to the bellows convolutions as shown in the figure, demonstrated the best overall performance. This material rebounded striking forces within reasonable limits and withstood the other tests better than its competitors.

Used as a linear between the conventional wire braid and the bellows, the RTV silicone does not detract from assembly flexibility and interposes a shock absorber of considerable usefulness. In those cases where the wire braid is not required for end restraint and where protection of the bellows is the only consideration, the RTV silicone bumper alone performs very well.

Note:

Requests for further information may be directed to:

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Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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Category 06